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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/839,596	04/20/2001	Giuseppe Croce	99AG39853288	1496

7590 08/10/2005

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EXAMINER	
NADAV, ORI	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 08/10/2005

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.

EXAMINER	
ART UNIT	PAPER
	062005

DATE MAILED:

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Commissioner for Patents

The examiner's answer that was mailed on 8/24/2004 has been signed and is enclosed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Loke can be reached on 571-272-1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.
6/23/05

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 0

Application Number: 09/839,596
Filing Date: April 20, 2001
Appellant(s): CROCE ET AL.

MAILED

AUG 2 4 2004

GROUP 2800

Paul J. Ditmyer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6/14/2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 5-18 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,665,988	Huang	9-1997
5,041,895	Contiero et al.	8-1991

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim 5 is rejected under 35 U.S.C. 102(b) as anticipated by Huang (5,665,988). Regarding claim 5, Huang teach in figure 1 and related text lateral diffused metal oxide semiconductor (LDMOS) integrated device comprising: a semiconductor substrate 1; a drain region 2 of a first conductivity type n- adjacent the semiconductor substrate and comprising a superficial buffer region 13 being more heavily doped n than adjacent portions of the drain region; a body region 9 surrounded on a bottom and sides thereof by the buffer region 13 and having a second conductivity type p; and a source region 11 in the body region 9 and having the first conductivity type n+.

Claims 6-11 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang.

Regarding claims 7, 9 and 14, Huang teaches substantially the entire claimed structure, as applied to claim 5 above, except a superficial buffer region having a dopant

concentration of about 5E16 to 5E17 atoms cm(-3) and the adjacent portions of the drain region having a dopant concentration of about 2.5E15 to 2.5E16 atoms cm(-3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a superficial buffer region having a dopant concentration of about 5E16 to 5E17 atoms cm(-3) and the adjacent portions of the drain region having a dopant concentration of about 2.5E15 to 2.5E16 atoms cm(-3), in Huang's device, because it well within the skills of an artisan to adjust the relative concentrations of the superficial buffer region and the drain region in order to optimize the device characteristics. Note that differences in concentration do not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQZd 1843 (Fed. Cir.),cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1 147, 14 USPQZd 1056 (Fed. Cir. 1990).

Regarding claims 6 and 15, Huang teaches substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a drain region having a depth of about 1.5 to 4.5 micrometers. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a drain region having a depth of about

1.5 to 4.5 micrometers, in Huang's device, in order to use the device in an application which requires a specific reverse voltage characteristics.

Regarding claims 8 and 16, Huang teaches substantially the entire claimed structure, as respectively applied to claims 5 and 14 above except a superficial buffer region having a depth of about 0.15 to 0.45 micrometers. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a superficial buffer region having a depth of about 1.5 to 4.5 micrometers, in Huang's device, in order to adjust the ON resistance such that optimum characteristics of the device can be obtained, and in order to use the device in an application which requires specific switching speed.

Regarding claims 10 and 17, Huang teaches substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a body region having a depth of about 0.25 to 0.75 micrometers. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a body region having a depth of about 1.5 to 4.5 micrometers, in Huang's device, because it well within the skills of an artisan to adjust the relative thicknesses of the device's regions in order to optimize the device characteristics.

Regarding claims 11 and 18, Huang teaches substantially the entire claimed structure, as respectively applied to claims 5 and 14 above, except a body region having a dopant

concentration of about 5E17 to 5E18 atoms cm(-3). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form a body region having a dopant concentration of about 5E17 to 5E18 atoms cm(-3), in Huang's device, because it well within the skills of an artisan to adjust the relative concentration of the body region in order to optimize the device characteristics. Note that differences in concentration do not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQZd 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQZd 1056 (Fed. Cir. 1990).

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Contiero et al.

Regarding claim 12, Huang teaches substantially the entire claimed structure, as applied to claim 5 above, except a drain region doped with phosphorous and wherein the body region is doped with boron. Contiero et al. teach in figure 1 a drain region doped with phosphorous and a body region doped with boron. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to

dope the drain region with phosphorous and the body region with boron, in Huang's device, because phosphorous and boron are conventional doping materials, of which official notice is taken.

Regarding claim 13, Huang teaches substantially the entire claimed structure, as applied to claim 5 above, except a drain region doped with boron and a body region doped with phosphorus. That is, Huang does not reverse the polarity of the transistor. Contiero et al. teach in figure 1 a complementary LDMOS (i.e. n-channel and p-channel LDMOS transistors). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to dope the drain region with boron and the body region with phosphorus, in Huang's device, in order to use the device in an application which requires a complementary LDMOS device.

(11) Response to Argument

Appellant argues that Huang teaches an IGBT device and not an LDMOS.

An LDMOS device has a structure similar to that of an IGBT device, with the exception that the LDMOS has a substrate of the same conductivity type as that of drain layer whereas the IGBT has a substrate of the opposite conductivity type to that of drain layer. That is, the IGBT includes a pn junction (a diode) in the drain region in order to cause conductivity modulation during operation. Therefore, the structure of an IGBT

can be considered as being similar to that of an LDMOS with the addition of a diode in the drain region.

Regarding Huang's device, although Huang teaches in figure 1 a semiconductor device "having the functions of a horizontal IGBT" (column 6, lines 37-39), the structure of Huang's device comprises the structure of an LDMOS (with the addition of a diode in the drain region). Therefore, although Huang's device functions as a lateral IGBT, Huang's structure comprises the structure of the claimed lateral LDMOS.

Furthermore, the recitation of a lateral DMOS occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). In this case, since appellant does not claim that the substrate of the device has the opposite conductivity type to that of the drain layer, the body of the claim recites a structure that is identical to that of Huang's structure.

Moreover, appellant teaches in figure 1a and related text an LDMOS device comprising a p type substrate having the opposite conductivity type from that of the drain well 12 (page 2, lines 11-14). Appellant further teaches that "in the drawings, like numbers are used throughout to refer to similar elements" (page 5, lines 10-12). Applicant also discloses that the claimed invention provides simple solution to punch through problems without introducing substantial changes in the known LDMOS

structure (page 5, lines 2-3). Therefore, it is understood that the substrate 11 of figure 2b is also of the p type and has the opposite conductivity type from that of the drain well 12. Since appellant defines in the disclosure the LDMOS structure as a structure which comprises a p type substrate having the opposite conductivity type from that of the drain well, Huang's structure is also an LDMOS structure Huang's structure also comprises a p type substrate having the opposite conductivity type from that of the drain region.

Appellant argues that the drain region in Huang's device is region 8 and not region 2.

Although claims 5 and 14 recite a drain region 12 comprising a buffer region 15, "drain region" 12 is an n type epitaxial layer 12 (page 4, line 1) or "a drain well region" (page 5, lines 14-19) and not a conventional drain region. In fact, a drain region (or the drain contact region) is an essential region in an LDMOS device since it provides a contact point for external connections to the drain of the device. Figure 2b and the disclosure of the present application do not describe a drain region. Huang, on the other hand, teaches in figure 1 a device formed in an n type epitaxial layer 2, wherein an n+ drain region (or drain contact region) 8 is formed in the n type epitaxial layer 2. External contact T2 is connected to the drain contact region 8. Therefore, although appellant claims epitaxial layer 12 as "a drain region", epitaxial layer 12 should correspond to Huang's epitaxial layer 2, and not to drain region 8.

Appellant argues that the body region of Huang is base region 3 and not region 9, as described by the examiner.

Appellant claims a second conductivity type region surrounded by a first conductivity type buffer region, and a first conductivity type source region in the body region. Appellant calls the second conductivity type region a body region. Huang also teaches a second conductivity type region 9 surrounded by a first conductivity type buffer region 13 and a first conductivity type source region 11 in region 9. Therefore, region 9 of Huang can also be called a body region. Thus, Huang teaches a second conductivity type body region 9 surrounded a first conductivity type buffer region 13 and a first conductivity type source region 11 in the body region 9, as claimed.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

O.N.
August 10, 2004

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